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ABSTRACT

An examination and evaluation of the papers presented at the Pittsburgh conference on the theory and practice of beginning reading instruction shows that there is little interaction between basic research in reading and applied work on reading instruction. Classroom instruction relies more on intuition and experience than on laboratory research, while laboratory research frequently bypasses the issues that are most important in applied reading instruction. The reason for the apparent division between applied work and experimental research in reading is that there is no effective theory of reading. Once an effective model of the reading process exists, reading research and practice will unite, and genuine progress will occur. (RL)

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Concerning the Marriage of Research and Practice: A Discussion of the Papers Presented at the Conference in Beginning Reading Instruction, Pittsburgh, April 1976.

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This paper was presented at the conference on Theory and Practice of Beginning Reading Instruction, University of Pittsburgh, Learning Research and Development Center, April 1976.

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The invitation by the organizers of this conference to come here as a discussant took me by surprise. I accepted gladly, and am not sorry that I did: listening these two days here was for me quite an educational experience, and for once, I think, I have really learned something new. My first task was to figure out why I was invited, since I am certainly not an expert on reading. My guess is that the organizers wanted me to provide the experimental psychologist's viewpoint. Therefore, I shall try to respond to this implicit task demand, and direct most of my comments to one issue: the problem of the unconsumated marriage of research and practice in reading instruction. I propose to inquire into the interrelationship of research and application in the papers presented at this meeting. In other words, I shall ask to what extent is the art a science. However, I can't quite resist the temptation to step out of my role as an expert on something-or-other and shall try to tell you what I perceive the state of the art to be, after listening for two days.

Let us take a look at the role basic research should play in the practice of reading instruction in an ideal world. First of all, we would want a theory of reading as a subtheory of cognitive processing, with an appropriate experimental data base to back it up. Secondly, we would have a body of applied

research, including just plain "experience", in order to arrive at guidelines for educational practice. How close are we to this state of affairs?

Note that I am not asking what is good or bad, or right or wrong. I am merely trying to characterize the relationship between theory, basic research, and educational practice in the field of reading. It is necessary to have a clear idea about this relationship as a prerequisite for a serious evaluation of the state of the art in reading instruction. The comments that follow are directed only towards this limited objective. I am not making a value judgment of the sort that every statement made here that is not supported by basic research findings is no good. It is clear that reading instruction relies upon several different sources: basic research, but also applied research (e.g. program evaluation), as well as experience, speculation, and logical task analyses. I make no claim that one of these is necessarily superior to the others; I am merely interested in sorting out the role of basic experimental research and general cognitive theory in this total picture.

The first point I want to establish is that basic research appears to play a relatively minor role in the practice of reading instruction, which is largely based upon classroom experience and intuition. I don't think this will surprise you, so I'll try to be brief. I shall discuss some examples of evaluative statements from some of the papers and look at the basis of the evaluation given.

For a start, I picked ten such examples haphazardly from the Beck and Block paper. For three data are cited:

1) The GINN prereading program is criticized as too broad - and Venezky's work is cited that prereading does not entail high cognitive loads.

2) It is claimed to be good practice to avoid the production of phonemes in isolation, and relevant research data are given as the reason.

3) An emphasis on pure auditory discrimination is lauded, again on the basis of research data showing that this is difficult for children.

In the fourth case, a recommendation is made where relevant research data could have been cited:

4) It is said to be important to give frequent opportunity to apply learned correspondences - which is supported by a large body of data on repetition and spacing effects in learning, encoding variability, etc.

In the other six cases, the argument is made without recourse to research results:

5) When should morphemes be introduced - is it true that "materials should be as meaningful as possible within the constraints of vocabulary control"?

6) Should the introduction of long and short vowels be separated by 1 week, 1 year, - or perhaps not at all?

7) Beck and Block "suspect that Palo Alto's method (of adhering to one-to-one mappings between sounds and letters) may result in the child's becoming locked into a single-word-single-sound misunderstanding".

8) It is claimed that GINN's phonic instruction relies too much upon already existing abilities.

9) For questions after reading, GINN's WH-questions are said to be better than Palo Alto's questions about where in the text something is.

10) Both programs go from sound to letter (spelling), but Beck and Block say from letter to sound is better "for it goes in the same direction as the terminal behavior".

The score is three (or four) to six for intuition. I am not saying these intuitions are bad; but note that these questions could all be answered by research.

Let's look at some similar examples from Bateman's paper, paying little more attention to the pitfalls that arise with this reliance upon intuition. For instance, (1) Venezky's program, the DISTAR program, and Bateman's own proposal all rely very heavily upon logical task analyses of reading. Three components of reading are emphasized: (a) responding to a grapheme with a phoneme, (b) the appropriate temporal sequence, (c) the blending of the phonemes. Are these supposed to be stages of information processing, or at least components thereof? If so, are they separable? Additive? Are they the right ones? As cognitive psychologists we know from sad experience that we can't simply go and assume that our logical analysis corresponds to how the head works! These are problems that cry out for research! Logical analysis says, for instance, that letter-naming should not be included as a subskill of reading. However, as Holland points out in his contribution, while letter naming is not itself a part of reading, making discriminative responses to the letters certainly is. I find it very hard to trust these logical task analyses very far. Certainly, they are a good starting point, but what I have observed over and over again here, is that they are too often also a stopping point.

Let me continue with a few more examples from the same paper.

2) DISTAR'S teaching to mastery is praised for avoiding wasted practice. Again, there is no experimental evidence for this claim, as far as I can tell, and knowledge of the overlearning literature makes me doubt that it is correct.

3) Rozin and Gleitman claim that "semantics is easier than syntax than phonology", and "syllables are easier than phonemes". Some hard evidence would be nice; after all children learn to talk very early and respond to phonemes while still in the crib (but not, I suppose, to NP's).

4) Some unsupported statements from Glass: "Meaning should be made irrelevant to decoding instruction", "Successful decoders do not consciously use rules, so no rules should be taught" - why? (Note the beautiful counter-example later in Bateman's paper when she talks about the Pointy Rule).

I don't want to belabor the point too much. Without questioning the uses of intuition, experience, etc. as a guide to reading instruction, I would suggest that research results could and should be used more widely and more effectively.

For two claims made by Sticht I would like to add supporting data from my own laboratory.

1) Sticht's main thesis is that the language processes in (adult) reading and auding are the same. As part of a larger experiment, Kintsch et al. (1975) have compared immediate recall of 70-word paragraphs for listening and reading (with the reading time equated to the listening time). There were several experimental conditions, but the relevant observation here is merely that in all of them mean performance was within 1% for reading and listening. Indeed, when we did a very detailed analysis of exactly which propositions were recalled from the texts, the over-all correlation over propositions was $r=.86$ between reading and listening. Clearly, there will be situations where reading-listening differences will be obtained, but at least for our college student subjects it didn't matter at all whether they read a text or listened to it. I would even go further than that. We have done considerable work on

the nature of inferences that people make when reading simple stories (the work of Keenan, McKoon and Kintsch, in Kintsch, 1974). We have replicated this work with cartoon sequences, that is, we let pictures rather than words tell the story (Baggett, 1975): in all crucial respects the similarities between the text- and picture-conditions are overwhelming. When it comes to cognitive processing the precise nature of the perceptual input is less interesting than the content of the message being processed.

2) The second point concerns the observation Sticht makes that the content of a text is the main determinant of reading rates. We have shown that the time subjects take to read a text is an approximately linear function of the number of propositions which are expressed by that text, even when the number of words in the text is controlled (Kintsch and Keenan, in Kintsch, 1974). The number of propositions expressed by a text is an objective measure of what others have called "idea density". Our result implies that each proposition requires a certain comprehension time (of the order of 1-1.5 sec), and that increasing reading speed merely means that fewer propositions will be processed.

Turning now from the applications to the experiments, again I shall not ask whether these studies are good or bad as experiments, but what they tell us about the practice of reading instruction.

Let me continue with Sticht's paper. He reports an experiment on reading talk in first grade which is informative with respect to the auding-reading issue: children are only slightly better when they read their own talk than when they read the talk of other children; This is a negative, but relevant result. On the other hand, the two experiments in the form of training programs that Sticht reports have little direct bearing on the issue at hand. The

oracy training program provided ambiguous results which are of little use and the adult literacy program showed mainly that transfer needs to be specific rather than general, but has no relevance to the auding-reading question.

In contrast, Sticht's test instrument to measure the auding-reading gap is an excellent example of how basic research can be fruitfully applied in reading instruction.

Perfetti and Lesgold discuss a series of experiments designed to investigate whether good readers are better able to organize what they read than poor readers. Their results are disappointing, in that they failed repeatedly to find differences in organization between skilled and non-skilled readers. However, I would like to suggest that they were looking in the wrong place. They are looking at syntactic chunking, as it is induced by the phrase structure of sentences. Such phrase-structure chunking is important in sentence perception, however, only when the task is one of verbatim repetition of the sentence. They should have looked at the semantic organization of the text by skilled and non-skilled readers. How is the content of a text organized? Are skilled readers better able to form a notion of the gist of a passage than poor readers? We have investigated problems of the over-all organization of text, the formation of summaries, etc. for some time now, and a report on this work can be found in Kintsch (1976).

Perfetti and Lesgold continue with a number of interesting experiments on coding speed, memory interference effects, tachistoscopic recognition, matching and categorization tasks. However, only the first of these is used in their section on "Implications for the teaching of reading": coding speed measures are proposed for measuring coding efficiency. The two other implications

they talk about are quite independent of the experiments that had gone before: What is good practice? Who needs practice? We are back to intuition here (though note that both questions are perfectly good research problems).

I conclude therefore that practice in reading instruction is largely intuitive, relying upon "experience" and program evaluation studies, and only to a small extent upon basic research findings. Basic research findings tend to be a bit removed from questions of practice. The reason for this undesirable state of affairs is, in my opinion, the lack of theory.

We have good experiments on various components of reading and reading programs, but the two are insufficiently interrelated, because we dont' have a theory of reading worth speaking of. Without theory to guide us the many bits and pieces we now have refuse to fall in place.

A number of speakers here have talked to us about their theoretical ideas - primarily Chall, Frederiksen, Goodman, and Shuy. But these presentations were at a gross level, lacking specificity and detail. They constitute preliminary ideas towards the formation of a theory of reading, rather than the well worked-out theory that we need. We may have some good beginnings here, but not more than that.

I find Frederiksen's ideas highly congenial, I think he made some important points, and I would not quarrel with the general thrust of his paper (and I don't think this is the place to argue over minor details). But the level of his presentation is too general to be very useful. Such terms as top-down and bottom-up are merely catch words when they are used without further specification. Exactly what is meant when Frederiksen calls inference making a top-down process? Consider the sentence pair:

It is spring in Pittsburgh. The grass is green.

A reader will probably make the inference that there is some kind of connection between these two sentences, e.g. a causal one. In what way does this top-down process of inference formation change when we provide the reader with an explicit cue in the text as to the connection between the sentences, as in:

It is spring in Pittsburgh. Therefore, the grass is green.

What happens if we give the reader, instead of an explicit cue, merely a general indication that he is supposed to look for some kind of connection, as in:

It is spring in Pittsburgh, and the grass is green, too.

Do we change from top-down in the first example to bottom up processing in the second, and to what in the third?

Similarly, what are we to make of Frederiksen's claim that the child reverts to bottom-up processing when he encounters "difficulty"? There seems to be a grain of truth here, but we are overwhelmed by vagueness.

Goodman's discussion of language functioning is excellent and important, but it suffers from the same lack of specificity. Shuy provides some detail in this respect, but he only outlines what needs to be done. What we really need in order to make this approach work is something like Shuy's Figure 2 on a much grander scale, with special emphasis on how these various language functions are realized in speech and print.

Next, consider an example from Sticht. He talks about the "ability to comprehend", and "complete comprehension". One cannot stop with terms like these. They are merely broad, descriptive phrases behind which we hide our lack of understanding of the information processing involved, its stages, their interrelations, resource requirements and so on - in other words, a precise model of "comprehension".

Chall's stage theory of reading is most interesting and will undoubtedly become very influential. She herself makes the point that the present work is merely preliminary, and I can only second her in stressing the need for greater specificity. In particular, the stages must be defined at the information processing level. I shall come back to this point later, but consider here Chall's characterization of Stage 2 learning. The child reads "for confirming what is already known" and "learns to use the redundancy of the language" - perhaps this is so, but what we would need is a step-by-step processing analysis of how such learning occurs. This is very important, since Chall thinks that Stage 2 is a main failing point for many literacy campaigns!

I would also like to raise a voice of caution about the use of the concept "stages of reading". "Stage" implies that something is changing qualitatively. As an example, consider the transition from Stage 2 to Stage 3. Chall argues that there are peculiarities in the information processing in the child's reading during Stage 2 that prevent him from acquiring new information via reading. Therefore, children in this stage read and re-read things that they already know - fairy tales, "Little House on the Prairie", or religious tracts in the old days. Between Stage 2 and 3 the reading process changes, enabling the child to learn new things by reading, at first in a limited way. Further changes in the characteristics of the reading process occur later, making reading more and more useful and flexible.

This is a nice analysis, but do we really need the concept of a stage? We can only teach what is already partly known. New information can only be successfully handled if there exists an apperceptive mass to which it relates. The reason kids must read fairy tales and "Little House on the Prairie" for so

long is that this is all they can absorb. As they learn more, their horizon broadens and they are better able to learn from reading. They can't learn from reading in "Stage 2", not because of any peculiarities of their information processing, but simply because their knowledge base is too small. As their knowledge increases, it becomes easier and easier to add to it.

Chall would argue that children in Satge 2 learn orally, but not from reading. However, this might simply be a resource allocation problem. When reading is not yet fully automated, most of the reader's resources are used up by the decoding process, leaving insufficient resources for the comprehension process. When I read French, I encounter a similar problem: most of my resources go into translating, so that at the end of a page I often find that I don't remember anything from it, though I had laboriously read it! Similarly, college students in laboratory experiments who are given mirror reversed texts to read often remember very little of the content of what they had read.

I am not saying that Chall is wrong in talking about stages of reading. I am merely saying that I am not yet convinced that such a radical assumption is really necessary. One certainly should explore the alternative of describing reading development in terms of a continuity of information processes. What changes might be the type of material that can be read, and the use people can make of the information - not necessarily the reading process itself.

The kind of model called for here is illustrated in this conference by the work of Venezky and Massaro. Before discussing it, let me back up a bit and remind you of some of the ground rules for the construction of information processing models, as discussed in the contribution of Perfetti and Lesgold.

They assumed that:

1) reading is a complex process with interrelated but isolable components, and

2) the relationship between skilled reading and beginning reading is not a straightforward one (but I should add, neither is such a relationship absent, and there are researchers like Goodman who specificially claims that there is only one kind of reading).

Venezky and Massaro's contributions, as I said, is the kind of detailed work we need, but at the same time this particular work illustrates some of the dangers of this approach. Basically, they start with a perceptual analysis that transforms the visual stimulus into a possible letter list; here the orthographic regularity effects are important (see their Figure 1). Further analysis constructs the visual representation of a word from the possiblities generated earlier. From there they go to the abstract representation of the word, at which point speech and reading merge and Venezky and Massaro stop.

The trouble is that they have separated components out of the total system and neglected feedback loops from higher cognitive processes (linguistic-syntactic, semantic and pragmatic analyses of the message) that greatly influence not the visual analysis per se, but the use that the system makes of its output. In other words, it is a fine model for word recognition but not for reading. The serial stages imply that a stage must be finished before the next one becomes operative. But it is possible that output is continuously available and that lower level analyses are rarely completed to the point where they would provide a "list of possible letters for each position in a word". Indeed, the full visual analysis of a letter takes considerable time (300

msec by some accounts) and higher-order processes do not wait for them to be completed. Instead, decisions are made on the basis of partial visual analyses and context. Reading is not just decoding, but also context utilization - and I think Venezky and Massaro tend to neglect the latter.

"The primary goal of initial reading instruction is rapid word recognition, which is the only major skill unique to reading". But it does not follow that initial reading is best taught as word recognition. Our goal is reading, not word recognition.

Venezky and Massaro's criticisms of the Johnson experiment is justified, and I would like to repeat it. When words are compared with words, if just one or two letters are perceived as identical, or as different, the subject can make a response "same", or "different", respectively. However, when a target letter is compared to the word, each letter of the word must be checked against it. But the point that Venezky and Massaro seem to miss is that reading is like word matching - a hypothesis testing process, with feedback loops so that there is no need to analyze all the letters of a word, if you can make out the word from just a few; it is not like letter detection, which requires a more complete analysis.

Venezky and Massaro's conclusion is probably correct: that "phonemic quality and word meaning do not influence the initial visual resolution of the letter string" but so what? The problem here is that a component process of reading is treated in isolation. The real question is to what extent is reading (in the initial reader, in the skilled reader) determined by visual factors, orthographic regularity, phonemic quality, whole word features, syntax, semantics, the macrostructure of the message, etc.

Venezky and Massaro will say, of course, that they are not talking about reading in general but initial reading. Obviously decoding here is crucial. But it does not follow that we can neglect everything else. Even if they suggest the perfect instructional program for word recognition (= initial reading), it still might be unsatisfactory as a reading program because it assumes that all other cognitive processes involved in the target behavior may safely be neglected in initial instruction. Perhaps so, but we should not just assume it.

In spite of this weakness of the model (In part this weakness simply reflects shortcomings of their presentation, because more complete descriptions of their model do take into account the factors whose omission I have criticized here, e.g. Massaro, 1975). the Venezky and Massaro approach is, I think, exemplary in this group because it is the only one that is specific and detailed enough to be seriously criticized. (Just one nice example of the virtue of being specific: one can argue forever about the role of phonemic encoding in reading without any hope of agreement, but in the present model phonemic coding is specified in such a way that it becomes an empirically decidable issue). Perfetti and Lesgold's theoretical notions are much more vague in comparison. The bottleneck theory they discuss is very general. What they call the by-pass model is so vague and so implausible (does it really presume that there are no central processing limitations in the human organism)? that it is useless.

Indeed, Perfetti and Lesgold propose to bypass the kind of cognitive psychology models that I am calling for here. They say we know about correlation, but we don't know about causation (If there is a moral discernible in the papers presented here, it is certainly this: that we continually get ourselves into trouble because we don't know how to interpret correlational data). They

propose to bypass the hard task of determining causal chains, and to go directly to the educationally most relevant problems: what should one do in terms of practice and instruction to improve reading. My preference would be to given an answer to this question based upon a sound information processing model of reading. It is the long way, but I don't see much reason to trust shortcuts.

What I have said so far can be summarized quite easily. Applied work on reading instruction appears to flourish (though the actual practice in the classroom seems to be another matter yet). Basic research in reading is going equally strong, especially in so far as it concerns decoding problems. But the interaction between the two is insufficient: applications rely more on intuition and experience than upon laboratory research, and the laboratory research frequently bypasses the issues that are most important in reading instruction. I have tried to argue that the lack of a serious theory of reading is one of the main reasons for this state of affairs. Compared to the level of specificity that is found in some of the applied work (e.g. Beck and Block, Bateman), and the precision of the experimental research (e.g. Venezky and Massaro, Perfetti and Lesgold), the poorly articulated global analyses that pass for theories in the field of reading are disappointing indeed. I don't think that we can hope for an improvement in the relationship between reading research and practice, and between basic and applied research in reading, until we have a good model of the reading process. As we have seen in this conference, there exist some promising theoretical ideas around which such a model might evolve, and that is the point where progress must occur if the whole area is to develop soundly.

At the beginning of this discussion I had set myself the task of exploring the relation between research and practice, as it is reflected in the papers presented here. This task done, I would like to look at the status of reading research in a more general way.

I am puzzled by two seemingly contradictory facts. First, I read in the newspapers almost continuous complaints that somewhere between 25% and 30% of our children "can't read". Secondly, I learn at this conference that we have the reading programs now to teach all children (or at any rate 98% of them) to read. This claim was made explicitly by Bateman, but it was implicit, in much of our discussion here and confirmed in several conversations I have had in the last two days by people who ought to know.

To resolve this conflict, I shall borrow Shuy's very handy outline of the factors involved in reading. My adaptation of Shuy's Figure 5 is shown below, and I want to make a single, rather simple point with it. The excellent programs for early reading instruction that we have available today rely primarily upon the teaching of letter-sound correspondences (decoding, in teacher talk), as shown by point A in my figure. Semantic and pragmatic factors play a minor role when children learn to read in this way. When we say that we have reading programs available today, that if they were actually used in our schools would assure that practically all children could read, we mean that we know how to get a child to read in the manner designated by point A. Skilled reading, on the other hand, is a different matter, as shown by B. While, with our best instruction procedures today, we can get a child to A, we don't know how to get him from A to B. Most of the time the child will, of course, make that transition (and be helped by our teaching), but we don't have the

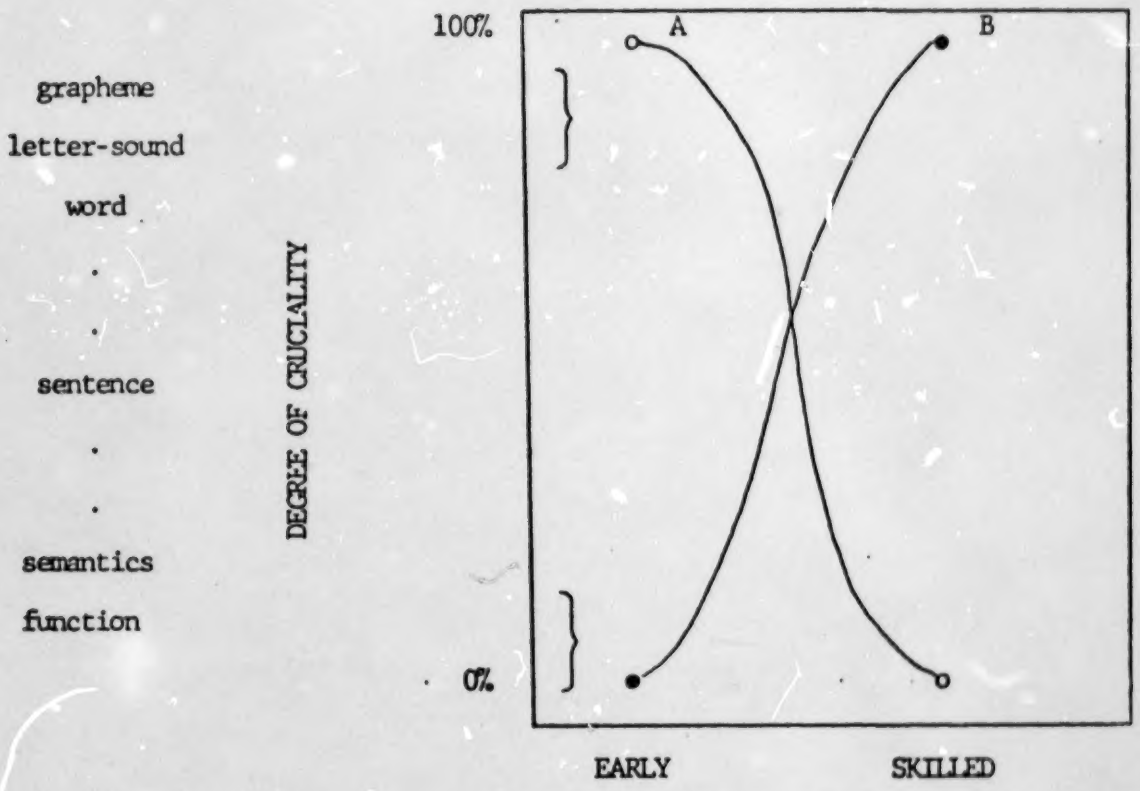

Figure 1. A graph after Shuy, showing the dependence of early reading upon letter-sound correspondences, with semantic-functional cues playing a minor role, and the ascedance of the latter as the reader becomes skilled.

same degree of control over this phase of learning to read that we do in getting the beginning reader to A.

Indeed, the experts disagree at this point. The majority at this conference sees the problem as one of phasing A out and B in. This viewpoint is best articulated in Chall's stage analysis. We know how to get to A, the problem is to keep up our advantage and prevent the transition problems that often occur in the second and third grades. What happens in the later grades is not really a reading problem, but a general congitive problem. Even if we could close the auding-reading gap quite early, most of those 25-30% "who can't read" would still not be able to perform at the 8th grade level.

The minority opinion, ably represented here by Goodman, believes that starting at A interferes with the later achievement of B, and that a better procedure would be to teach the beginning reader to use pretty much the same cues of a semantic-functional type that support skilled reading. It might be harder to start that way, but it avoids problems later.

It would appear that the decoding party would need to show us how to solve the transition problem in Figure 1, and the advocates of reading-for-meaning would have to develop beginning-reading instruction programs as successful as the decoding-oriented programs. I certainly can't tell you which of these alternatives will eventually be the best, but if the analysis that I have given here is correct it has sharpened the issues a little.

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OPEN DISCUSSION OF KINTSCH PRESENTATION

VOSS: Speaker requested that his comments be deleted.

KINTSCH: No, I can't. And I think I have a lot of evidence to back up the claim that this would be impossible. Look at what is happening in artificial intelligence. When you want to get a computer to comprehend even a simple sentence, you can't do it unless you give the computer the required knowledge structure. So comprehension and knowledge acquisition, I think, are very closely interrelated, and the best comprehension training that I can think of is just to teach the kids more and more.

VOSS: Speaker requested that his comments be deleted.

GOODMAN: My favorite way of saying that is that everybody is functionally illiterate to some extent, and you are functionally illiterate in the things that you lack background to deal with. That is one of the reasons why, in the beginning reading, you stay with things that are relevant and understandable within the experiential and perceptual background of the kids who are doing the learning.

CHALL: There is so much evidence of all kinds that knowledge is terribly important for reading. One is the very high correlation that you have between vocabulary knowledge and reading comprehension. The other is that the better readers, on standardized texts, are the ones who are better educated. And--I loved hearing you say this--in order to be a good reader, you have to have a good education.

BATEMAN: It occurs to me that the illiterate are not among us. They really aren't represented in this conference, and I think that illiteracy is like a disease. If there were some other disease as devasting to the individual afflicted and to our total society as functional illiteracy is, we would not be sitting here saying we need more theory or they need more theory. We would first cure the damn disease; then, we would sit in our meeting and talk about what kind of bug really caused it.

I very much want the record to show that while we sit here accurately recognizing that our theories are incomplete and that our data are incomplete, we, nonetheless, know enough to teach kids to read, and we are not doing it.

I also think it is very important that, in addition to sitting here, we also recommend that somebody get out there and teach kids to read, because we all need it--kids need it, and we need it.

Amen.

GOODMAN: For the record also: cancer is a disease, too, but you are not going to let every quack out there try to cure people, just because people are dying every day.

FREDERIKSEN: I would like to follow up on a discussion Jim Voss brought up; that is, the notion that when you teach the decoding component, you come to a point where you get into skilled stages--if you want to use the word stage--and everything becomes very specific. In fact, all comprehension is specific to some knowledge that a person has. The thing that I feel should be addressed is what I perceive as a kind of a break that occurs between the kind of reading children are asked to do in the early grades and the kind they have to do once they get

out of early reading instruction, when they are no longer being taught specifically by reading teachers. That seems to be a point at which difficulties, related not to inability to decode but to these other aspects of the process, crop up. I was trying to address that problem in my paper by saying that we have to be concerned in the earliest stages with the whole process. We have to consider the effects of what we do to train one component on the whole system. That problem has to do with extending reading instruction into the later grades, and it also involves some different kinds of considerations about instruction in the early grades.

GLASER: Speaker requested that his comments be deleted.

VOSS: Speaker requested that his comments be deleted.